

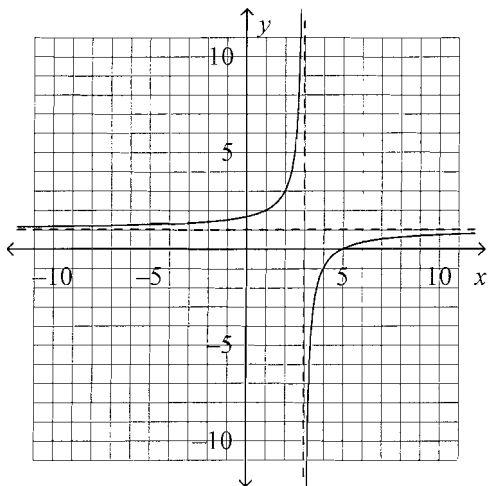
Final 2009 Honors**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

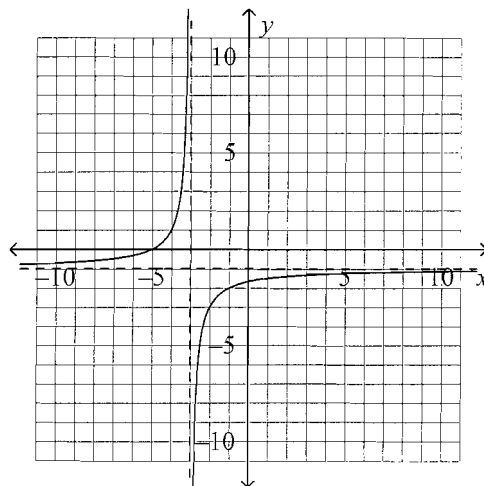
Sketch the asymptotes and graph the function.

A 1. $y = \frac{-2}{x-3} + 1$

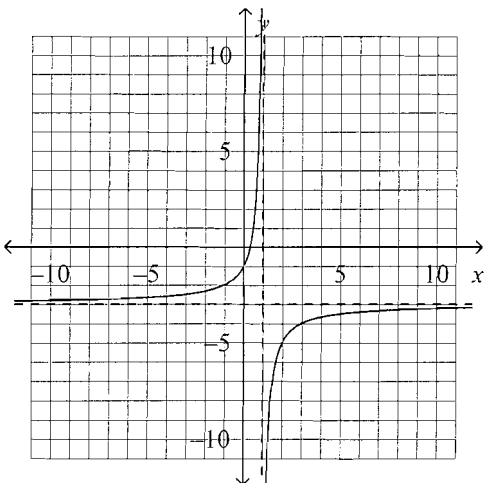
a.



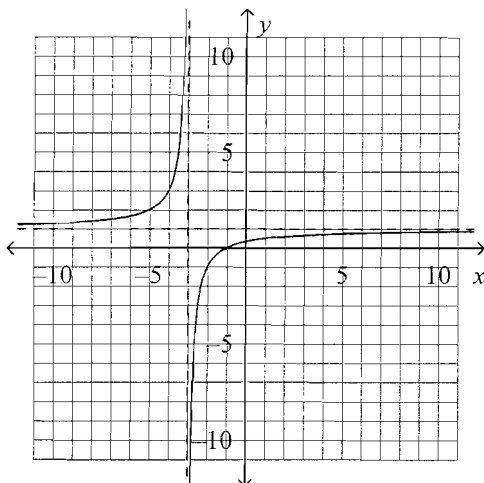
c.



b.



d.



B2. Write an equation for the translation of $y = \frac{-6}{x}$ that has the asymptotes $x = -5$ and $y = -3$.

a. $y = \frac{-6}{x+3} - 5$

c. $y = \frac{-6}{x-3} - 5$

b. $y = \frac{-6}{x+5} - 3$

d. $y = \frac{-6}{x-5} - 3$

Find any points of discontinuity for the rational function.B

3. $y = \frac{x+1}{x^2+10x+24}$

a. $x = -1$

c. $x = 4, x = 6$

b. $x = -4, x = -6$

d. $x = -4, x = 6$

C4. Suppose $f(x) = 4x - 2$ and $g(x) = -2x + 1$.Find the value of $\frac{f(0)}{g(3)}$.

a. -2

b. 10

c. $\frac{2}{5}$

d. 2

A5. through $(-8, 6)$ and perpendicular to $y = -\frac{2}{3}x + 1$.

a. $y = \frac{3}{2}x + 18$

b. $y = -\frac{2}{3}x + \frac{2}{3}$

c. $y = \frac{2}{3}x + \frac{34}{3}$

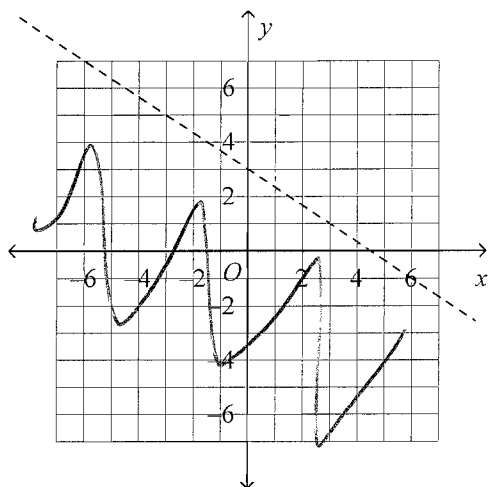
d. $y = -\frac{3}{2}x - 6$

Graph the inequality.

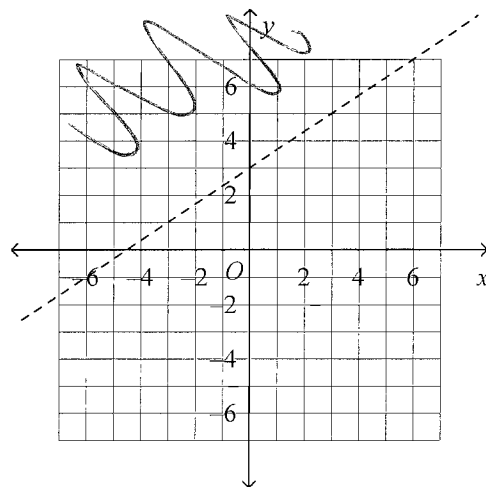
B

6. $-2x - 3y < -9$

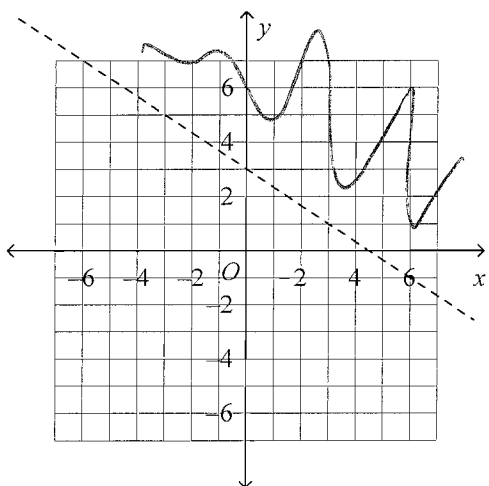
a.



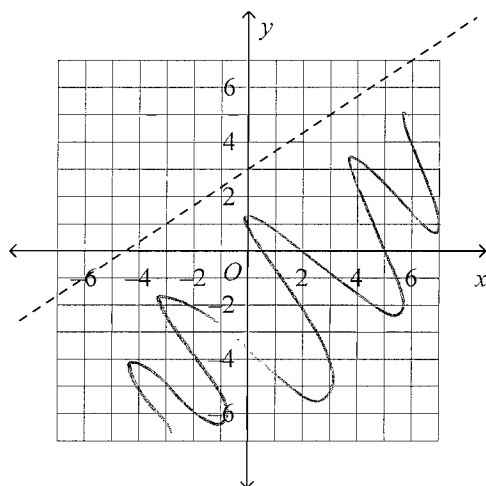
c.



b.



d.



Use the elimination method to solve the system.

C

7.
$$\begin{cases} -2x + 3y = -7 \\ -6x + 9y = -9 \end{cases}$$

a. $(2, 4)$

b. infinite solutions

c. no solutions

d. $(-2, -4)$

FoilA

8. $f(x) = (3x + 5)(-4x - 2)$

a. $-12x^2 - 26x - 10$

b. $-26x - 10$

c. $15x^2 + 23x - 10$

d. $-12x^2 - 10$

D

9. Solve by factoring.

$4x^2 + 2x - 30 = 0$

a. $3, -\frac{4}{3}$

b. $-3, 4$

c. $\frac{5}{2}, -\frac{4}{3}$

d. $-3, \frac{5}{2}$

D

10. Find the missing value to complete the square.

$x^2 + 6x + \underline{\hspace{1cm}}$

a. 36

b. 81

c. 6

d. 9

D**Rewrite the equation in vertex form.**

11. $y = x^2 + 12x + 28$

a. $y = (x + 12)^2 + 22$

b. $y = (x + 6)^2 + 64$

c. $y = (x + 12)^2 - 8$

d. $y = (x + 6)^2 - 8$

Solve the equation.B

12. $-5x^2 + x + 7 = 0$

a. $\frac{1}{5} \pm \frac{\sqrt{141}}{5}$

b. $\frac{1}{10} \pm \frac{\sqrt{141}}{10}$

c. $10 \pm \frac{\sqrt{282}}{10}$

d. $\frac{1}{10} \pm \frac{\sqrt{70}}{2}$

Simplify the expression.C

13. $(-10)^{-2}$

a. $-\frac{1}{100}$

b. 100

c. $\frac{1}{100}$

d. 20

A

14. $(3xy^3)^2(xy)^6$

a. $9x^8y^{12}$

b. $3x^8y^{12}$

c. $2x^3y^{12}$

d. $9x^8y^9$

B

15. Find the zeros of $y = x(x + 2)(x + 3)$.

a. 0, 2, 3

c. -2, -3, 2

b. 0, -2, -3

d. -2, -3

B

16. Write a polynomial function in standard form with zeros at 2, 4, and -1.

a. $f(x) = x^3 + 9x^2 - 24x - 6$

c. $f(x) = x^3 - 5x^2 + 2x - 6$

b. $f(x) = x^3 - 5x^2 + 2x + 8$

d. $f(x) = x^3 + 8x^2 - 5x + 2$

B

17. An initial population of 490 quail increases at an annual rate of 27%. Write an exponential function to model the quail population.

a. $f(x) = (490 \cdot 0.27)^x$

c. $f(x) = 490(0.27)^x$

b. $f(x) = 490(1.27)^x$

d. $f(x) = 490(27)^x$

B

18. Find the annual percent increase or decrease that $y = 0.35(2.3)^x$ models.

a. 230% increase

c. 30% decrease

b. 130% increase

d. 65% decrease

B

19. Suppose you invest \$1500 at an annual interest rate of 6.3% compounded continuously. How much will you have in the account after 7.5 years?

a. \$1,926.58

b. \$2,406.00

c. \$21,123.12

d. \$11,981.55

Write the equation in logarithmic form.D

20. $2^4 = 16$

a. $\log 16 = 4$

c. $\log_4 16 = 2$

b. $\log 16 = 4 \cdot 2$

d. $\log_2 16 = 4$

Evaluate the logarithm.

- C 21. $\log_5 \frac{1}{625}$
a. 4 b. -3 c. -4 d. 5

Write the expression as a single logarithm.

- C 22. $6 \log_b v + 4 \log_b q$
a. $(6 + 4) \log_b (v + q)$ c. $\log_b (v^6 q^4)$
b. $\log_b (v q^{6+4})$ d. $\log_b (v^6 + q^4)$

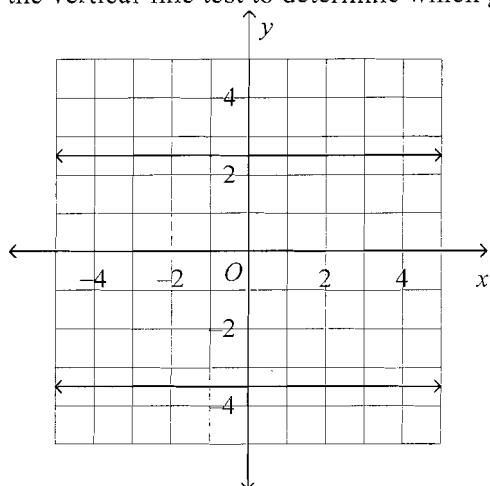
- C 23. Solve $125^{9x-2} = 150$.
a. -1.8847 b. -0.1069 c. 0.3375 d. 1.0378

- V 24. Solve $\log(8x + 2) = 1$.
a. 8 b. $\frac{5}{4}$ c. $-\frac{1}{8}$ d. 1

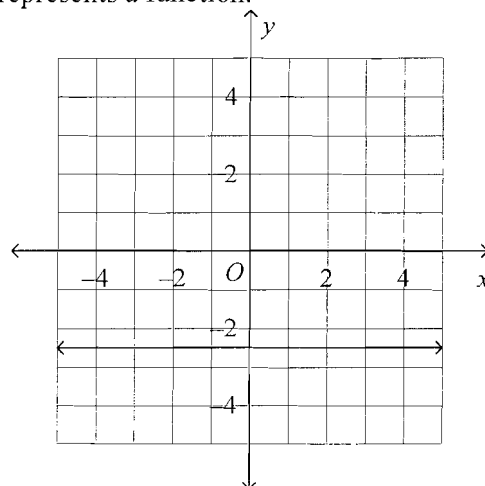
- A 25. Solve $\log 3x + \log 11 = 3$. Round to the nearest hundredth if necessary.
a. 30.3 b. 3,666.67 c. 272.73 d. 33,000

26. Use the vertical-line test to determine which graph represents a function.

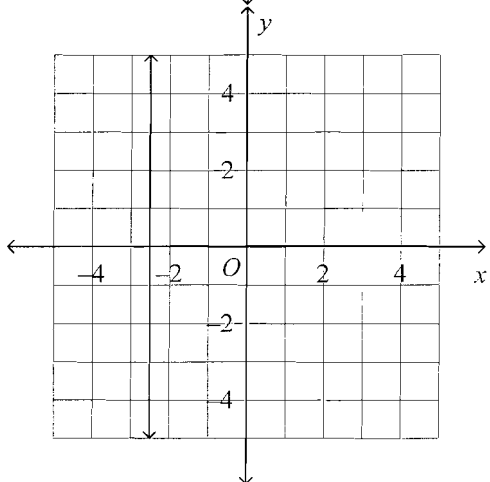
a.



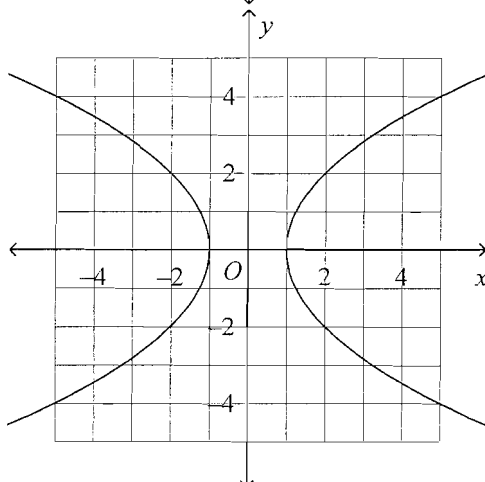
c.



b.



d.



Find the slope of the line through the pair of points.



27. $(-3, 11)$ and $(5, -2)$

a. $\frac{8}{13}$

b. $-\frac{13}{8}$

c. $\frac{13}{8}$

d. $-\frac{8}{13}$

- A 28. A leaky valve on the water meter overcharges the residents for one gallon of water in every $2\frac{1}{2}$ months. The overcharged amount w varies directly with time t .
- Find the equation that models this direct variation.
 - How many months it will take for the residents to be overcharged for 8 gallons of water?

a. $w = \frac{2}{5}t$; 20 months

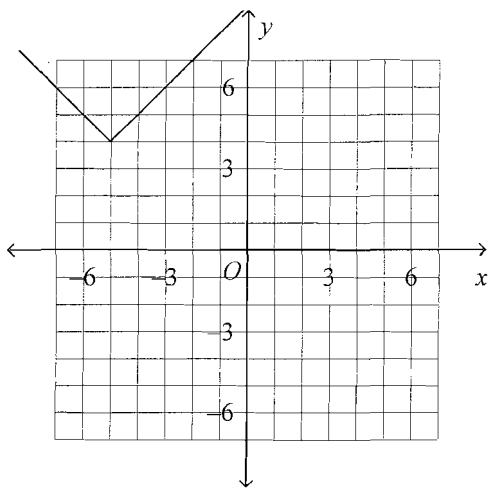
c. $w = \frac{2}{5}t$; $3\frac{1}{5}$ months

b. $w = \frac{5}{2}t$; 20 months

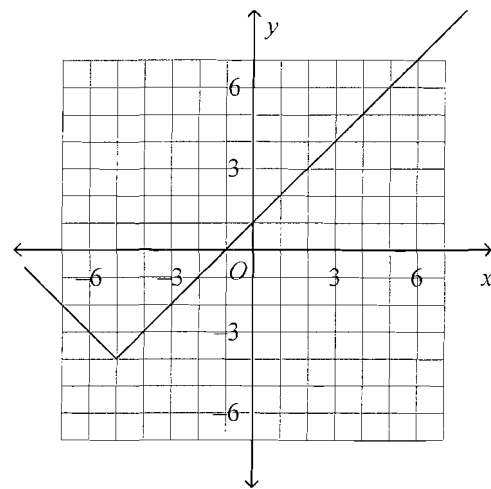
d. $w = \frac{5}{2}t$; $3\frac{1}{5}$ months

- D 29. Graph the function $y = |x - 4| + 5$.

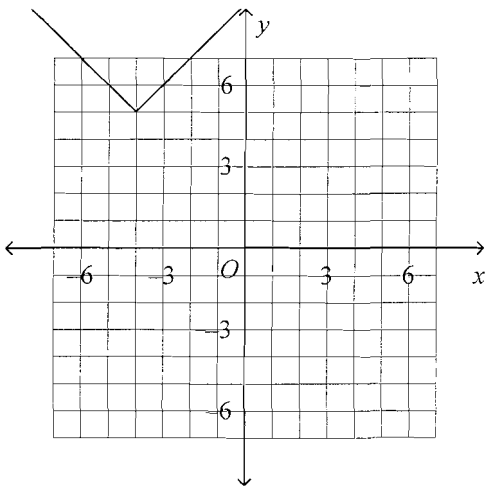
a.



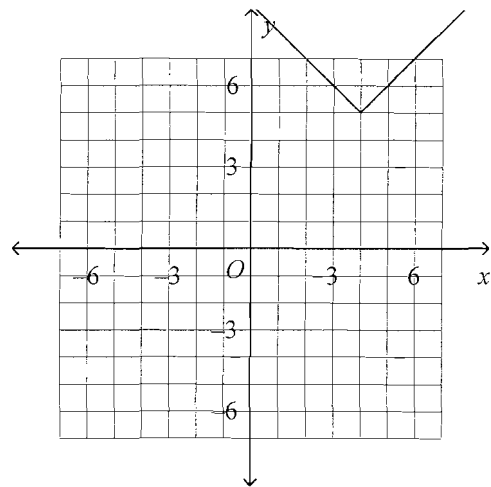
c.



b.

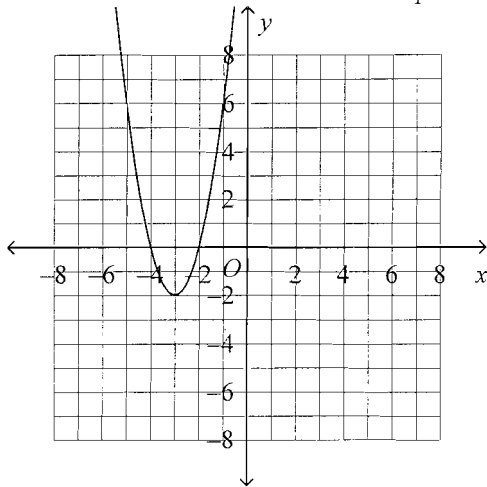


d.



A

30. Use the vertex form to write the equation of the parabola.



- a. $y = 2(x + 3)^2 - 2$ c. $y = 2(x - 3)^2 - 2$
 b. $y = (x + 3)^2 - 2$ d. $y = 2(x - 3)^2 + 2$

Factor the expression.A

- 31.
- $14x^2 + 12x$

- a. $2x(7x + 6)$ c. $14x(x + 6)$
 b. $7x(x + 2 + 6)$ d. $x(14x + 12)$

B

- 32.
- $x^2 + 11x + 24$

- a. $(x + 3)(x - 8)$ c. $(x + 8)(x - 3)$
 b. $(x + 3)(x + 8)$ d. $(x - 8)(x - 3)$

Simplify the expression.D

- 33.
- $(1 - 3i) - (-3 - i)$

- a. $-4 + 2i$ c. $2i$
 b. $-2 - 4i$ d. $4 - 2i$

A

- 34.
- $(2 - 2i)(3 + i)$

- a. $8 - 4i$ c. $4 - 4i$
 b. $6 - 4i$ d. $6 - 2i$

Solve the quadratic equation by completing the square.

C 35. $3x^2 + 5x = -11$

a. $\frac{5}{6} \pm \frac{\sqrt{28}}{6} i$

c. $-\frac{5}{6} \pm \frac{\sqrt{107}}{6} i$

b. $-\frac{5}{3} \pm \frac{\sqrt{127}}{3} i$

d. $\frac{5}{3} \pm \frac{\sqrt{107}}{3} i$

Expand the logarithmic expression.

B 36. $\log_b \sqrt{\frac{57}{74}}$

a. $\frac{1}{2} \log_b 57 + \frac{1}{2} \log_b 74$

c. $\sqrt{\log_b 57 - \log_b 74}$

b. $\frac{1}{2} \log_b 57 - \frac{1}{2} \log_b 74$

d. $\log_b \frac{1}{2} (57 - 74)$

Multiply or divide. State any restrictions on the variables.

A 37. $\frac{z+4}{z+5} \div \frac{z-4}{z^2+7z+10}$

a. $\frac{(z+4)(z+2)}{z-4}, z \neq -5, 4$

c. $\frac{(z+4)(z-4)}{(z+5)^2(z+2)}, z \neq -5, -2$

b. $\frac{(z+4)(z-4)}{(z+5)^2(z+2)}, z \neq -5, -2, 4$

d. $\frac{(z+4)(z+2)}{z-4}, z \neq -2, 4$

Add or subtract. Simplify if possible.

D 38. $\frac{d^2 - 9d + 20}{d^2 - 3d - 10} + \frac{d^2 - 2d - 8}{d^2 + 4d - 32}$

a. $\frac{2d^2 - 11d + 12}{(d+2)(d+8)}$

c. $\frac{2d^2 - 11d + 12}{2d^2 + d - 42}$

$$\frac{d^2 - 9d + 20}{(d+2)(d+8)} + \frac{d^2 - 2d - 8}{(d+2)(d+8)}$$

$$\frac{2d^2 - 8d - 28}{(d+2)(d+8)}$$

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ID: A

39. $\frac{a^2 + 2a - 3}{a^2 - 9a + 18} \div \frac{a^2 - 5a - 6}{a^2 + 9a + 8}$

a. $\frac{21a - 28}{(a - 6)(a + 8)}$

b. $\frac{2a^2 - 28}{(a - 6)(a + 8)}$

c. $\frac{-3a + 44}{(a - 6)(a + 8)}$

d. $\frac{2a^2 + 18a + 44}{2a^2 + 44}$

Solve the equation. Check the solution.

40. $\frac{a}{a^2 - 36} + \frac{2}{a - 6} = \frac{1}{a + 6}$

a. -9

b. -6

c. -9 and -6

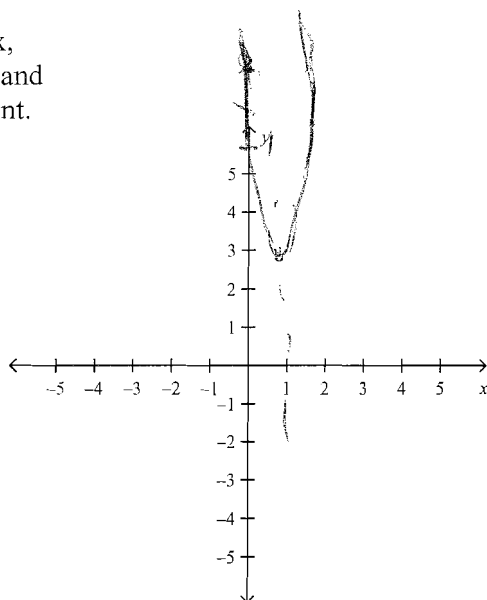
d. 6

Completion

Complete each statement.

41. Graph $y = 6(x - 1)^2 + 3$

Identify the vertex,
axis of symmetry and
one additional point.

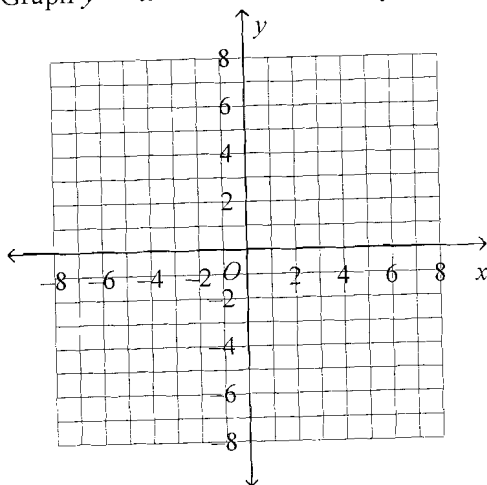


Short Answer

42. Is the relation $\{(-2, -3), (0, -2), (2, -5), (4, -5), (-3, -2)\}$ a function? Explain.

yes

43. Graph $y = x^2 + 3x + 2$. Identify the vertex and the axis of symmetry.



vertex $(-\frac{3}{2}, -\frac{1}{4})$
 $x = -\frac{3}{2}$

44. Without graphing, determine whether the function $y = 12\left(\frac{11}{13}\right)^x$ represents exponential growth or exponential decay.

Decay $b < 1$

Essay

45. Show that $2x^2 - 12x + 23$ is equal to $2(x - 3)^2 + 5$. Then use this to explain how you know that 5 is the minimum value of the function.

$$h = -\frac{b}{2a}$$

$$2(x-3)^2 + 5$$

$$2(x-3)(x-3) + 5$$

Other

46. In a particular region of a national park, there are currently 430 deer, and the population is increasing at an annual rate of 11%.

a. Write an exponential function to model the deer population.

b. Explain what each value in the model represents.

c. Predict the number of deer that will be in the region after five years. Show your work.

$$y = 430(1.11)^x$$

$$y = 725$$

47. A baseball player hits a fly ball that is caught about 4 seconds later by an outfielder. The path of the ball is a parabola. The ball is at its highest point as it passes the second baseman, who is 127 feet from home plate. About how far from home plate is the outfielder at the moment he catches the ball? Explain your reasoning.

$$127 + 127 = 254$$

highest pt = $\frac{1}{2}$ total Distance

48. A data processing consultant charges clients by the hour. His weekly earnings E are modeled by the function $E = -0.2x^2 + 40x$, where x is his hourly rate in dollars. Can he earn \$2500 in a single week? Explain.

$$2500 = -0.2x^2 + 40x$$

$$-2500$$

$$0 = -0.2x^2 + 40x - 2500$$

No

✓